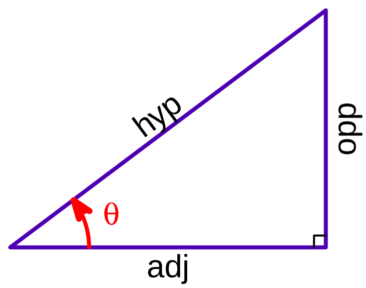
Right-triangle trigonometry cheat sheet



SOHCAHTOA

$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}} \qquad \text{opp} = \text{hyp} \cdot \sin(\theta) \qquad \text{hyp} = \frac{\text{opp}}{\sin(\theta)} \qquad \theta = \arcsin\left(\frac{\text{opp}}{\text{hyp}}\right)$$

$$\cos(\theta) = \frac{\text{adj}}{\text{hyp}} \qquad \text{adj} = \text{hyp} \cdot \cos(\theta) \qquad \text{hyp} = \frac{\text{adj}}{\cos(\theta)} \qquad \theta = \arccos\left(\frac{\text{adj}}{\text{hyp}}\right)$$

$$\tan(\theta) = \frac{\text{opp}}{\text{adj}} \qquad \text{opp} = \text{adj} \cdot \tan(\theta) \qquad \text{adj} = \frac{\text{opp}}{\tan(\theta)} \qquad \theta = \arctan\left(\frac{\text{opp}}{\text{adj}}\right)$$

Tangent Identity

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$$

Pythagorean Identities

$$\text{adj}^2 + \text{opp}^2 = \text{hyp}^2 \qquad \text{hyp} = \sqrt{\text{adj}^2 + \text{opp}^2} \qquad \text{adj} = \sqrt{\text{hyp}^2 - \text{opp}^2} \qquad \text{opp} = \sqrt{\text{hyp}^2 - \text{adj}^2}$$

$$\sin^2(\theta) + \cos^2(\theta) = 1 \qquad \sin(\theta) = \sqrt{1 - \cos^2(\theta)} \qquad \cos(\theta) = \sqrt{1 - \sin^2(\theta)}$$

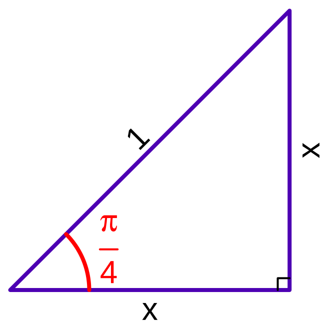
$$\tan^2(\theta) + 1 = \frac{1}{\cos^2(\theta)} \qquad \tan(\theta) = \sqrt{\frac{1 - \cos^2(\theta)}{\cos^2(\theta)}} \qquad \cos(\theta) = \sqrt{\frac{1}{\tan^2(\theta) + 1}}$$

$$\tan^2(\theta) + 1 = \frac{1}{1 - \sin^2(\theta)} \qquad \tan(\theta) = \sqrt{\frac{\sin^2(\theta)}{1 - \sin^2(\theta)}} \qquad \sin(\theta) = \sqrt{\frac{\tan^2(\theta)}{\tan^2(\theta) + 1}}$$

Special Right Triangles

Isosceles Right Triangle

- Both legs are congruent, and both acute angles are congruent.
- Each acute angle has a measure of 45°, which is equivalent to $\frac{\pi}{4}$ radians.

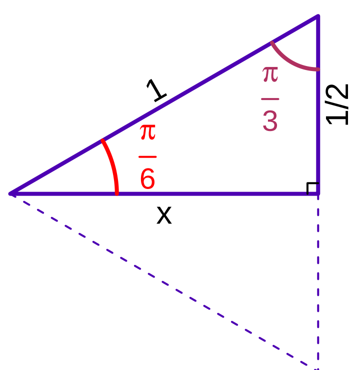


Solve $x^2 + x^2 = 1^2$ to get $x = \frac{\sqrt{2}}{2}$. Thus,

$$\sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} \qquad \cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} \qquad \tan\left(\frac{\pi}{4}\right) = \frac{\left(\frac{\sqrt{2}}{2}\right)}{\left(\frac{\sqrt{2}}{2}\right)} = 1$$

Half of an equilateral

- After cutting an equilateral triangle in half (through a line of symmetry), we get one leg half as long as the hypotenuse. We also get 30° and 60° as the acute angle measures. In radians, the acute angle measures of $\frac{\pi}{6}$ and $\frac{\pi}{3}$.



Solve $x^2 + \left(\frac{1}{2}\right)^2 = 1^2$ to get $x = \frac{\sqrt{3}}{2}$. Thus,

$$\sin\left(\frac{\pi}{6}\right) = \frac{1}{2} \qquad \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2} \qquad \tan\left(\frac{\pi}{6}\right) = \frac{\left(\frac{1}{2}\right)}{\left(\frac{\sqrt{3}}{2}\right)} = \frac{\sqrt{3}}{3}$$

$$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2} \qquad \cos\left(\frac{\pi}{3}\right) = \frac{1}{2} \qquad \tan\left(\frac{\pi}{3}\right) = \frac{\left(\frac{\sqrt{3}}{2}\right)}{\left(\frac{1}{2}\right)} = \sqrt{3}$$